

What is claimed is:

1. A method for determining a number of objects comprising the steps of:

determining a projection space including the objects,
wherein a distance between two adjacent objects is substantially
the same for each pair of adjacent objects;

determining an adaptive threshold according to a number of
objects determined to be in the projection space;

determining an inter-object distance according to an
average inter-peak distance at the adaptive threshold; and

determining a number of objects in the projection space
according to the inter-object distance.

2. A method for determining a number of balls in a projection
space comprising the steps of:

determining a projection of a portion of a ball grid array;

determining at least one local maximum of the projection
space for a given threshold;

determining a distance between adjacent maximum;

determining an inter-peak histogram of the distances;

determining an inter-ball distance for each pair of
adjacent balls that has the maximum value of the inter-peak
distance histogram corresponding to the pair of adjacent balls;

determining a position of a first ball and a position of a last ball;

verifying the position of the first ball and the position of the last ball based on a general inter-ball distance; and

determining the number of balls.

3. The method of claim 2, wherein the step of determining a projection further comprises the step of projecting a row/column of ball image a direction, wherein the direction is one of horizontally and vertically.

4. The method of claim 2, wherein an inter-peak distance bin width is a tolerance of the general inter-ball distance.

5. The method of claim 2, wherein the number of balls is determined according to:

$$N = \frac{\text{distance between the first and the last ball}}{\text{inter - ball distance}} + 1$$

where N is the number of balls and the inter-ball distance is determined according to a maximum value of the inter-peak distance histogram.

6. The method of claim 2, wherein the given threshold is determined.

7. The method of claim 6, wherein determining the threshold comprises the steps of:

determining the number of balls in the projection space for one or more given threshold values in a threshold searching range based on the general inter-ball distance of ball grid array components;

determining a histogram for the number of balls;

determining a threshold range comprising a plurality of threshold values, wherein each threshold value corresponds to a maximum number of balls at the threshold value; and

setting the threshold to one of a mean threshold value and a median threshold value of the threshold range.

8. The method of claim 7, wherein the histogram shows a maximum frequency of the number of balls.

9. The method of claim 2, wherein the general inter-ball distance is an average of the distances between each pair of adjacent balls.

10. A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to

perform method steps for determining a number of balls in a projection space, the method steps comprising:

determining a projection of a portion of a ball grid array;

determining at least one local maximum of the projection

5 space for a given threshold;

determining a distance between adjacent maximum;

determining an inter-peak histogram of the distances;

determining an inter-ball distance for each pair of adjacent balls that has the maximum value of the inter-peak distance histogram corresponding to the pair of adjacent balls;

determining a position of a first ball and a position of a last ball;

verifying the position of the first ball and the position of the last ball based on a general inter-ball distance; and

determining the number of balls.

11. The method of claim 10, wherein the step of determining a projection further comprises the step of projecting a row/column of ball image one a direction, wherein the direction is one of horizontally and vertically.

12. The method of claim 10, wherein an inter-peak distance bin width is a tolerance of the general inter-ball distance.

13. The method of claim 10, wherein the number of balls is determined according to:

$$N = \frac{\text{distance between the first and the last ball}}{\text{inter - ball distance}} + 1$$

where N is the number of balls and the inter-ball distance is determined according to a maximum value of the inter-peak distance histogram.

14. The method of claim 10, wherein the given threshold is determined.

15. The method of claim 14, wherein determining the threshold comprises the steps of:

determining the number of balls in the projection space for one or more given threshold values in a threshold searching range based on the general inter-ball distance of ball grid array components;

determining a histogram for the number of balls;

determining a threshold range comprising a plurality of threshold values, wherein each threshold value corresponds to a maximum number of balls at the threshold value; and

setting the threshold to one of a mean threshold value and a median threshold value of the threshold range.

16. The method of claim 15, wherein the histogram shows a maximum frequency of the number of balls.

17. The method of claim 10, wherein the general inter-ball distance is an average of the distances between each pair of adjacent balls.